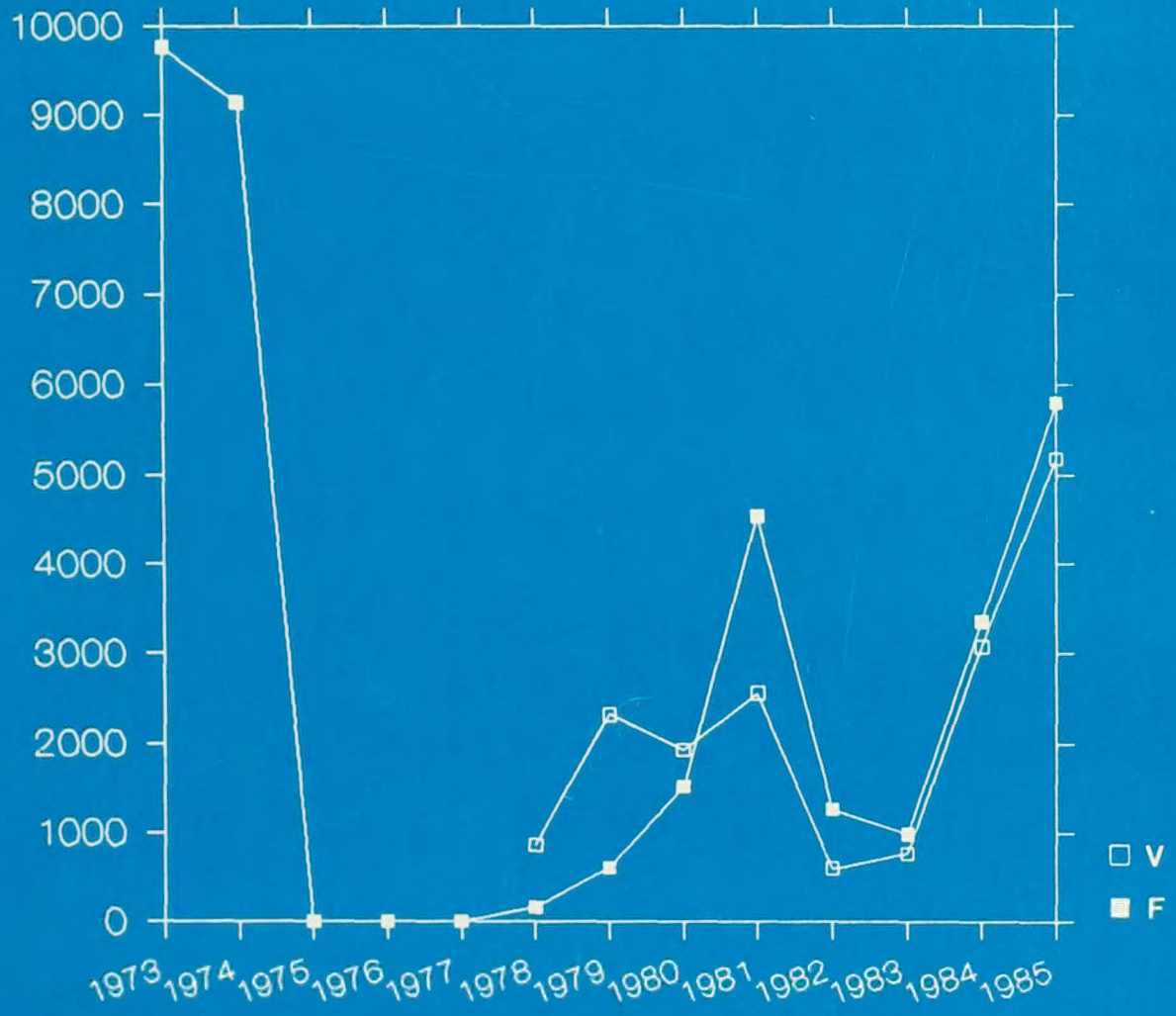
Leo Vanhecke

Serial observations on the size of orchid populations in Europe:

a characterization of the literature



Scripta Botanica Belgica **3**

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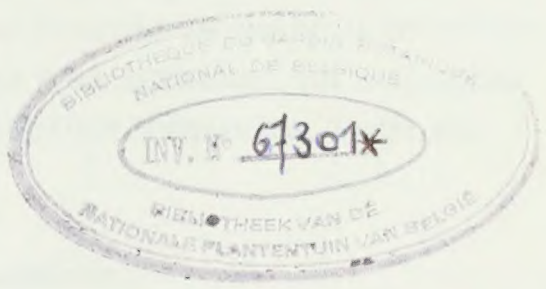

Meise
National Botanic Garden of Belgium
1992

INTRODUCTION

The growing "popularity" of European orchids and the democratization of their study in the past decades had a serious impact on the number and diversification of the orchid literature. Population dynamics of orchids, the study of the development and behaviour of orchid populations with time, is one of the aspects that receive more attention nowadays. This phenomenon might reflect the generally increased concern for the conservation of natural habitats and endangered species.

With serial observations on the size of orchid populations I denote all kinds of publications, from very professional, mostly demographically orientated analyses to very simple reports on the annual size of a population in two consecutive years. As a framework for comparing my own observations on *Dactylorhiza praetermissa* populations (Vanhecke 1985, 1988, 1991), I am compiling relevant literature in this field of research. These data were for the first time summarized in a synoptic comparative table made in 1991 (unpublished, in Dutch, intended for internal use only).

This original table was based on papers published until 1990 (with a few exceptions, however: some papers published in 1991, but that were available to me before their publication, were incorporated). Only European literature was taken into account. The reason for this is that already a virtually complete general bibliography exist of the European orchid literature (B. Willing & E. Willing 1977, 1985; E. Willing 1984-1991: semi-annual contributions in the "Mitteilungsblatt Arbeitskreiss Heimische Orchideen Baden-Wüttemberg" and the "Berichte aus den Arbeitskreisen Heimische Orchideen"). Even under these privileged conditions it showed rather difficult to gather all concerned publications since many were published in small, very local journals. It seemed impossible to me to start collecting in the same way papers from other continents, even without having the slightest idea of what already exists, on species that I do not know.

From the beginning the concept of this compilation work had two major objectives: (1) bringing together as much publications as possible which at least partially deal with fluctuations of the size of European orchid populations and (2) to standardize the information contained in these publications in order to make it possible to compare the available data. Therefore each publication was screened on a number of technical characteristics of their data concerning population dynamics, such as:

- the identity of the taxon(a) studied;
- the number of populations studied per taxon;
- the length of the longest uninterrupted series of observations;
- the total number of observation years;
- the overall length of the observation period(s);
- the size (maximal, minimal and average) of the studied population(s) during the total observation period.

The combination of these descriptive variables permits the user of the table to get a fairly good idea of the information contained in the cited papers. However, no effort was made to summarize or discuss the proper results mentioned in these papers, so that the reader is obliged to consult the cited literature.

In total this first synoptic table contained information from 58 publications of 56 authors on the pluri-annual observation-series of 184 populations of 41 orchid taxa (39 species and 2 interspecific hybrids). Some aspects of a global analysis of this original table were presented at Nijmegen (September 26th, 1992), on the occasion of Eurorchis 92, an international symposium on European orchids. The paper corresponding to this technical synthesis is in print (Vanhecke 1993).

After 1990 some important new papers and books (e.g. Wells & Willems 1991) concerning the study of the dynamics of European orchid populations were published, so it seemed appropriate to actualize the data of the original table and at the same time to broaden its potential use by translating it into English. No major changes in the concept of the table were introduced, but in order to gain maximal information on the population dynamics of European orchids, a single important publication, dealing with non European populations of *Epipactis helleborine* (Light & Macconaill 1991), was included.

In total 70 entirely new series of observations on the size of European orchid populations were added to the table, most of them (61) extracted from two publications. In addition to those, 26 "incomplete" series, dealing with transplanted (or sown) populations in a specially created orchid garden, are given. These last series are called incomplete because during the establishment of these species intentional introduction took place at several occasions and it is necessary to consult the original papers to be informed on all details. Eight more taxa had to be added to the first list, among them six new species, two interspecific hybrids and one intergeneric hybrid (one of these six species and the three hybrids belong to the group of transplanted orchids). On several populations, new observations continuing already familiar series, were published.

I finally want to thank all authors who were so kind to send me a reprint or a copy of their papers. Without this help, it would have been impossible to compile all information summarized into the present table. I am glad that in some way I am able to pay them back now by offering them this report. Certainly the present synoptic table is not yet complete, and probably it will never be. Also it is almost certain that it contains inaccuracies concerning the cited time-series. Any remarks or completions, corrections, as well as other suggestions will be received with gratitude and will serve to improve future editions.

It is probable that in some European countries more published observations than those included in the table exist. I am also convinced that many other series of observations on the fluctuating size of orchid-populations remained so far as unpublished notes in so many note-books. Perhaps this first attempt to synthesize the available information can help stimulating the people concerned to put their own results on paper.

ABBREVIATIONS USED IN THE TABLE

NEP: number of examined (partial) populations.
LUP: longest, uninterrupted observation period in years. x = see original publication.
TOY: total number of observation years. x = see original publication.
TLO: total length of the observation period in years. x = see original publication.
MAX, MIN, AVG: respectively highest, lowest and mean number of recorded orchid individuals: 0 = no, I = 1-50, II = 51-200, III = 201-500, IV = 501-1000, V = 1001-2500, VI = 2501-5000, VII = > 5000.
F-V: F = flowering, V = non-flowering individuals, ? = undefined or uncertain.
PRE: presentation of the data: g = graph(s), m = map(s), t = table(s), o = other.
LOC: AUS = Austria, BEL = Belgium, CAN = Canada, CSR = Czechoslovakia, DAN = Denmark, EST = Estonia, FIN = Finland, GER = federal Republic of Germany, HOL = The Netherlands, POL = Poland, SVE = Sweden, UKD = United Kingdom, URS = former Soviet Union.
REL: links in the text (not necessarily with each of the independent time-series) with N = nature management, E = ecology, C = climate, M = morphology, B = biology, S = spatial distribution.
REM: serial numbers correspond with specific remarks at the end of the table.

GENERAL REMARKS CONCERNING THE TABLE

- Nomenclature follows K.P. Buttler, 1986 (Orchideen, Die wildwachsenden Arten und Unterarten Europas, Vorderasiens und Nordafrikas, München, Mosaik Verlag, 287 pp.). Author-names of the hybrids are specified in the notes 45-50 at the end of the table.

- Values for MAX were chosen after comparison of all observation years (TOY).

- MAX, MIN, AVG-values: the combined numbers of flowering (F) and non-flowering (V) individuals were taken into account if both were available.

- Demographic studies were considered as "time-series" if they give also information on the fluctuations of the size of the population as a whole within the studied plot(s).

- If one and the same population is documented by successive publications, it is the most recent one, covering the longest possible observation period that was used for the parameters LUP-TOY.

- When a publication contains information on time-series based on the observations of different persons, not individually mentioned as authors in the paper itself, then this situation is indicated by adding "(ed.)" after the author(s) of the publication.

SYNOPTIC TABLE
CHARACTERIZING LITERATURE (< 1992)
ON SERIAL OBSERVATIONS ON THE
SIZE OF ORCHID POPULATIONS
IN EUROPE

	NEP	LUP	TOY	TLO	MAX	MIN	AVG	F-V	PRE	LOC	REL	REM
Aceras anthropophorum												
Wells 1981	1	15	15	15	III	II	III	FV	g	UKD	NECB	1
Morgan 1991	2	4	4	4	IV	I	III	F	t	FRA	-	37
		4	4	4	I	0	I	F	t	FRA		
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	x	x	x	II	I	I?	F(V)	gt	HOL	N	43 44
Anacamptis pyramidalis												
Sterk 1976a, 1976b	1	28	33	36	IV	0	III	F	g	HOL	NEC	
Asbirk (ed.) 1988	1	4	7	21	III	I	II	F	g	DAN	N	
Bruder & Rennwald 1990	2	2	2	2	I	I	I	F	o	GER	-	
		2	2	2	I	I	I	F	o	GER		
Morgan 1991	2	4	4	4	VI	III	V	F	t	FRA	-	37
		4	4	4	IV	II	III	F	t	FRA		
Diemont 1969, Bossenbroek 1980 Kreutz 1992	1	x	x	x	III	I	II	F(V)	gt	HOL	N	43 44
Cephalanthera damasonium												
Diemont 1968, Bossenbroek 1980	1	x	x	x	I	0	I	F(V)	gt	HOL	N	43
Hoffmann 1987	1	3	3	3	IV	II	III	FV	o	GER	M	
Potucek 1987	2	4	9	12	V	I	III	F	g	CSR	E	
		4	13	21	I	I	I	F	g	CSR		2
Wegener 1987	2	4	4	8	II	I	I	F?	g	GER	NE	
		2	6	19	V	I	IV	F?	g	GER		3
Morgan 1991	2	4	4	4	II	I	II	F	t	FRA	-	37
		4	4	4	I	I	I	F	t	FRA		
Cephalanthera longifolia												
Bruder & Rennwald 1990	1	2	2	2	I	I	I	F	o	GER	-	39
Coeloglossum viride												
Schadwinkel 1989	1	12	12	12	II	I	I	F	t	GER	EC	
Diemont 1969, Bossenbroek 1980 Kreutz 1992	1	x	x	x	I	I	I	F(V)	gt	HOL	N	43 44
Cypripedium calceolus												
Poulsen 1987	1	41	44	45	III	I	III	FV	g	DAN	-	
Salmia 1988	(8)	2-5	4-6	7	ΣII	ΣII	ΣII	FV	g	FIN	N	4
		5	6	7	I	I	I	FV	g			
		5	6	7	I	I	I	FV	g			
		5	6	7	I	I	I	FV	g			
		4	5	7	I	I	I	FV	g			
		4	5	7	I	I	I	FV	g			
		2	4	7	I	I	I	FV	g			
		2	4	7	I	I	I	FV	g			
		2	4	7	I	I	I	V	g			
Kull 1987; Kull & Kull 1991	4	9	12	13	II	I	II	FV	g	EST	ECMB	34
		7	7	7	II	I	II	FV	g	EST		
		7	7	7	II	I	I	FV	g	EST		
		6	6	6	II	II	II	FV	g	EST		
Dactylorhiza incarnata												
Vakhrameeva & Denisova 1980	1	4	4	4	II	II	II	FV	g	URS	E	5
Reinecke 1986, 1988, 1991, 1992	1	10	10	10	VI	I	V	F	g	GER	NE	40
Potucek 1985	2	13	13	13	I	I	I	F	t	CSR	-	6
		10	10	10	I	I	I	F	t	CSR		
Hemke 1987	2	11	12	13	III	I	III	F?	t	GER	E	3
		8	8	8	VI	I	IV	F?	t	GER		
Sarosiek & Kolon 1989	1	2?	4	7	II	I	I	F?	g	POL	E	7

	NEP	LUP	TOY	TLO	MAX	MIN	AVG	F-V	PRE	LOC	REL	REM
Dactylorhiza fuchsii												
Richardson 1957	2	5	5	5	I	I	I	F?	t	UKD	E	8
		4	4	4	I	I	I	F?	t	UKD		
Vakhrameeva & Denisova 1980	2	4	4	4	II	II	II	FV	g	URS	E	5
		4	4	4	II	I	I	FV	g	URS		
Morgan 1991	1	4	4	4	I	0	I	F	t	FRA	-	37
Diemont 1969,Bossenbroek 1980, Kreutz 1992	1	x	x	x	V	I	IV?	F(V)	gt	HOL	N	43 44
Dactylorhiza maculata												
Daiss et al. (1988)	1	3	6	10	II	I	I	F	m	GER	NS	33
Hermy & Vanhecke (eds.) 1990	3	2	6	19	II	I	II	F	g	BEL	N	
		3	3	3	I	I	I	F	g	BEL		
		2	2	2	I	I	I	F	g	BEL		
Dactylorhiza majalis												
Hamel 1977	2	2	4	6	III	I	II	F	t	GER	-	9
		2	4	6	II	I	I	F	t	GER		
Diemont 1969,Bossenbroek 1980	1	x	x	x	I	0	I	F(V)	gt	HOL	N	43
Ravnsted-Larsen (ed.) 1990	1	2	2	2	II	II	II	F?	t	DAN	-	
Hermy & Vanhecke (eds.) 1990	5	11	11	11	III	I	II	F	g	BEL	NE	
		5	7	8	I	I	I	F	g	BEL		
		5	5	5	II	I	II	F	g	BEL		
		4	5	9	II	I	II	F	g	BEL		
		4	5	8	V	I	III	F	g	BEL		
Bruder 1992	1	5	6	11	III	I	II	F	t	GER		52
Dactylorhiza praetermissa												
Vanhecke 1985, 1988, 1991	1	13	17	19	VII	0	VI	FV	gko	BEL	NEC	10
Hermy & Vanhecke (eds.) 1990	1	3	7	10	II	I	II	F	g	BEL		11
Dactylorhiza purpurella												
Richardson 1957	2	5	5	5	I	I	I	F?	t	UKD	E	8
		4	4	4	I	I	I	F?	t	UKD		
Dactylorhiza sambucina												
Heinrich (ed.) 1986	5	9	9	9	I	I	I	F	g	GER	-	
		7	7	7	I	I	I	F	g	GER		
		6	6	6	III	0	II	F	g	GER		
		5	9	11	II	I	I	F	g	GER		
		5	9	9	II	I	II	F	g	GER		
Tamm 1948,1972, 1991; Inghe & Tamm 1988	6	30	48	49	II	0	I	FV	g	SVE	NECB	12a
		12	14	15	I	I	I	FV	g	SVE		
		12	14	15	I	0	I	FV	g	SVE		
		12	14	15	I	0	I	FV	g	SVE		
		12	14	15	I	0	I	FV	g	SVE		
		12	14	15	I	0	I	FV	g	SVE		
Schadwinkel 1989	1	12	12	12	II	I	I	F	g	GER	EC	
Kümpel et al. 1989	2	22	22	22	I	0	I	F	g	GER	NE	
		4	4	4	II	0	II	F	g	GER		
D. x venusta												50
Richardson 1957	2	5	5	5	II	I	I	F?	t	UKD	E	8
		4	4	4	II	I	II	F?	t	UKD		
Epipogium aphyllum												
Reinhardt 1988	3	10	10	10	I	0	I	FV	t	GER	E	13
		9	9	9	I	0	I	FV	t	GER		
		8	8	8	I	0	I	FV	t	GER		
Epipactis atrorubens												
Morgan 1991	2	4	4	4	I	0	I	F	t	FRA	-	37
		4	4	4	I	0	I	F	t	FRA		
Diemont 1969,Bossenbroek 1980	1	x	x	x	I	0	I	F(V)	gt	HOL	N	43
Epipactis helleborine												
Salmia 1986	2	4	4	4	III	0	II	FV	mt	FIN	E	14
		4	4	4	II	I	I	FV	mt	FIN		
Diemont 1969,Bossenbroek 1980	1	x	x	x	I	0	I	F(V)	gt	HOL	N	43
Potucek 1987	4	4	9	12	II	0	I	F	t	CSR	E	
		4	9	12	I	0	I	F	t	CSR		
		4	8	10	I	0	I	F	t	CSR		
		4	13	21	I	0	I	F	t	CSR		15
Wegener 1987	1	4	4	8	I	I	I	F?	g	GER	NE	
Mösch 1988	1	9	11	12	V	I	III	F?	t	GER	-	
Light & Macconaill 1991	1	5	5	5	IV	III	III	FV	t	CAN	MB	36
Epipactis palustris												
Bruder 1992	1	6	7	11	II	I	I	F	t	GER	N	52

	NEP	LUP	TOY	TLO	MAX	MIN	AVG	F-V	PRE	LOC	REL	REM
Goodyera repens												
Sarosiek & Kolon 1989	1	2	3	5	I	0	I	F?	g	POL	E	7
Gymnadenia conopsea												
Vöth 1980	1	7	7	7	I	I	I	FV	g	AUS	EC	16
Daiss et al. 1988	1	3	6	10	II	I	II	F	om	GER	N	33
Sarosiek & Kolon 1989	1	2	3	9	II	I	II	F?	g	POL	E	7
Bruder & Rennwald 1990,	2	5	5	5	I	0	I	F	go	GER	N	53
Bruder 1992		7	7	7	III	I	II	F	go	GER		
Morgan 1991	2	4	4	4	V	IV	V	F	t	FRA	-	37
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	x	x	x	III	I	II	F(V)	gt	HOL	N	43 44
Gymnadenia odoratissima												
Morgan 1991	1	4	4	4	I	0	I	F	t	FRA	-	37
		4	4	4	IV	I	II	F	t	FRA		
Herminium monorchis												
Kümpel et al. 1989	2	15	15	15	VI	0	V	F	g	GER	N	
		15	15	15	V	0	IV	F	g	GER		
Diemont 1969, Bossenbroek 1980	1	x	x	x	I	0	I	F(V)	gt	HOL	N	43
Wells 1981	1	14	14	14	V	III	IV	FV	g	UKD	NECB	1
Himantoglossum hircinum												
Thirkell 1987	1	4	4	4	I	I	I	F	t	FRA	M	32
Wagner 1988	1	10	19	24	I	0	I	FV	o	GER	NE	17
Kümpel et al. 1989	2	19	19	19	III	I	II	F	g	GER	N	
		13	13	13	III	0	I	F	g	GER	N	
Morgan 1991	1	4	4	4	III	II	II	F	t	FRA	-	
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	x	x	x	I	I	I	F(V)	gt	HOL	N	43 44
Leucorchis albida												
Jäger 1989	1	9	9	9	II	0	I	FV	t	GER	EC	18
Liparis loeselii												
Wisniewski 1977	2	5	5	5	I	I	I	F(V)	o	GER	EM	19
		3	3	3	III	I	II	F(V)	o	GER		
Ravnsted-Larsen 1988, 1990	1	4	4	4	III	III	III	FV	g	DAN	NEC	
Listera ovata												
Vöth 1980	1	7	7	7	II	I	I	FV	g	AUS	EC	16
Potucek 1987	1	4	9	12	I	0	I	F	g	CSR	E	20
Tamm 1948, 1972, 1991; Inghe & Tamm 1988	1	26	40	47	II	I	I	FV	og	SVE	NECB	12b
Daiss et al. 1988	1	3	6	10	I	I	I	F	m	GER	NS	33
Kapteyn den Boumeester 1989	1	7	9	10	II	I	I	FV	t	HOL	E	
Morgan 1991	2	4	4	4	IV	IV	IV	F	t	FRA	-	37
		4	4	4	II	I	I	F	t	FRA		
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	x	x	x	IV	I	III?	F(V)	gt	HOL	N	43 44
Malaxis monophyllos												
Schadwinkel 1987	1	12	12	12	I	I	I	FV	g	GER	ECM	
Neottianthe cucullata												
Sarosiek & Kolon 1989	1	3	6	9	II	0	II	F?	g	POL	E	7
Neottia nidus-avis												
Potucek 1987	1	4	9	12	I	0	I	F	g	CSR	E	
Nigritella nigra												
Björkbäck & Lundqvist 1982	8	7	7	7	II	I	II	F	g	SVE	NEC	51
		5	6	7	II	I	II	F	g	SVE		
		4	4	4	II	I	I	F	g	SVE		
		3	4	7	II	I	II	F	g	SVE		
		3	4	7	II	I	I	F	g	SVE		
		3	3	3	I	I	I	F	g	SVE		
		3	3	3	I	I	I	F	g	SVE		
		3	3	3	I	I	I	F	g	SVE		
Björkbäck et al. 1986	(28?)	(11?)	(11?)	11	III	0	II?	F	g	SVE	N	21
Ophrys apifera												
Summerhayes 1951	1	4	4	4	II?V?	I	II?	F	o	UKD	-	22
Sipkes 1983; Kreutz 1981, 1987, 1992	1	19	30	34	V	I	III	F	g	HOL	B	23
Stahl 1989	(23)	2-8	8	8	ΣIII	ΣI	ΣII	FV	mt	GER	NECS	24
		8	8	8	II	I	I	FV	t			
		8(7)	8(7)	8	II	I	I	FV	t			

	NEP	LUP	TOY	TLO	MAX	MIN	AVG	F-V	PRE	LOC	REL	REM
Stahl 1989 (continuation)		8(7)	8(7)	8	I	I	I	FV	t			
		8(5)	8(6)	8	I	I	I	FV	t			
		8(3)	8(5)	8	I	I	I	FV	t			
		8(3)	8(3)	8	I	I	I	FV	t			
Van Wijngaarden 1989	1	3	3	3	III	I	II	FV	t	HOL	E	25
Bruder & Rennwald 1990, Bruder 1992	1	6	6	6	I	I	I	FV	g	GER	N	52
Wells & Cox 1989, 1991	1	11	11	11	IV	III	III	FV	gt	UKD	NECMB	41
Morgan 1991	1	4	4	4	I	I	I	F	t	FRA	-	37
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Ophrys holoserica												
Morgan 1991	2	4	4	4	III	III	III	F	t	FRA	-	37
		4	4	4	I	I	I	F	t	FRA		
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Ophrys x hybrida												47
Heinrich (ed.) 1986	1	5	9	11	?	0	?	F	g	GER	-	26
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Ophrys insectifera												
Heinrich (ed.) 1986	1	17	17	17	?	0	?	F	g	GER	-	26
Thirkell 1987	1	4	4	4	II	I	II	F	t	FRA	M	32
Daiss et al. 1988	1	3	6	10	I	I	I	F	ak	GER	NS	33
Morgan 1991	1	4	4	4	I	0	I	F	t	FRA	-	37
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Ophrys speghodes												
Hutchings 1987a, 1987b, 1989; Waite 1989; Waite & Hutchings 1991	1	10	10	10	II	I	II	FV	og	UKD	NECMB	1, 31 42
Heinrich (ed.) 1986	1	7	10	10	III	?	?	F	g	GER	-	26
Thirkell 1987	1	4	4	4	I	I	I	F	t	FRA	M	32
Finke 1991	1	8	8	8	II	I	I	F	t	GER	NCM	
Heyer 1991	6	12	12	12	III	I	II	F	t	GER	C	
		5	5	5	II	I	II	F	t	GER		
		5	5	5	I	I	I	F	t	GER		
		5	5	5	I	I	I	F	t	GER		
		5	5	5	I	I	I	F	t	GER		
		5	5	6	I	I	I	F	t	GER		
x Orchiaceras spurium												49
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Orchis x beyrichii												46
Diemont 1969, Bossenbroek 1980	1	×	×	×	I	0	I	F(V)	gt	HOL	N	44
Orchis coriophora												
Potucek 1985	2	4	17	27	II	0	I	F	t	CSR	-	
		4	11	20	I	0	I	F	t	CSR		
Orchis x hybrida												48
Diemont 1969, Bossenbroek 1980 Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Orchis mascula												
Willems 1978	6	11	11	11	IV	II	III	F	g	HOL	EM	
		10	10	10	I	I	I	F	g	HOL		
		9	9	9	I	I	I	F	g	HOL		
		9	9	9	I	I	I	F	g	HOL		
		7	7	7	I	I	I	F	g	HOL		
		6	6	6	I	I	I	F	g	HOL		
Wegener 1987, 1988	2	4	6	9	II	I	I	F?	g	GER	NE	38a
		5	7	27	III	II	II	F?	g	GER		38b
Tamm 1948, 1972, 1991; Inghe & Tamm 1988	2	19	21	23	I	I	I	FV	og	SVE	NEC	12c
		14	14	14	I	I	I	FV	og	SVE		
Ravnsted-Larsen (ed.) 1990	1	2	2	2	I	I	I	F	t	DAN	-	
Morgan 1991	2	4	4	4	III	II	III	F	t	FRA	-	37
		4	4	4	I	I	I	F	t	FRA		
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	I	I	F(V)	gt	HOL	N	43 44

	NEP	LUP	TOY	TLO	MAX	MIN	AVG	F-V	PRE	LOC	REL	REM
Orchis militaris												
Farrell 1985, 1991;	3	17	24	36	VI	III	V	F?	gt	UKD	EB	35a
Sanford 1991		16	16	16	I	0	I	FV	gt	UKD	E	35b
		8	12	13	II	I	I	FV	t	UKD	E	35c
Potucek 1985	4	13	13	13	II	I	II	F	t	CSR	-	
		13	13	13	I	0	I	F	t	CSR		
		4	17	27	II	0	I	F	t	CSR		
		4	11	20	III	I	I	F	t	CSR		
Asbirk (ed.) 1988	1	7	7	7	I	I	I	F	g	DAN	N	
Bruder & Brennwald 1990, Bruder 1992	1	11	11	11	I	I	I	FV	g	GER	N	52
Morgan 1991	2	4	4	4	IV	III	III	F	t	FRA	-	37
		4	4	4	III	II	II	F	t	FRA		
Orchis morio												
Potucek 1985	1	2	11	26	I	0	I	F	t	CSR	-	
Böhnert & Hamel (eds.) 1988	34	2-9	2-9	9	I-VI	0-IV	I-V	F	t	GER	NEC	
		9	9	9	V	II	IV	F	t	GER		
		9	9	9	III	I	II	F	t	GER		
		9	9	9	II	I	II	F	t	GER		
		9	9	9	I	I	I	F	t	GER		
		9	9	9	I	0	I	F	t	GER		
		9	9	9	I	0	I	F	t	GER		
		8	8	9	V	III	IV	F	t	GER		
		8	8	9	II	I	II	F	t	GER		
		8	8	9	II	I	II	F	t	GER		
		8	8	9	II	I	I	F	t	GER		
		8	8	9	I	I	I	F	t	GER		
		8	8	9	I	I	I	F	t	GER		
		8	8	9	I	I	I	F	t	GER		
		8	8	9	I	I	I	F	t	GER		
		8	8	9	I	0	I	F	t	GER		
		7	7	9	V	II	III	F	t	GER		
		7	8	9	I	0	I	F	t	GER		
		7	8	9	I	0	I	F	t	GER		
		7	8	9	I	0	I	F	t	GER		
		7	8	9	I	0	I	F	t	GER		
		7	7	9	VI	IV	V	F	t	GER		
		6	6	9	I	0	I	F	t	GER		
		5	5	9	VI	II	V	F	t	GER		
		4	4	9	I	I	I	F	t	GER		
		3	3	9	II	II	II	F	t	GER		
		3	3	9	II	II	II	F	t	GER		
		3	3	9	I	0	I	F	t	GER		
		3	3	9	I	0	I	F	t	GER		
		2	2	9	V	II	IV	F	t	GER		
		2	2	9	I	I	I	F	t	GER		
		2	2	9	I	I	I	F	t	GER		
		2	2	9	I	I	I	F	t	GER		
		2	2	9	I	I	I	F	t	GER		
		2	2	9	I	I	I	F	t	GER		
Ravnsted-Larsen 1987	1	4	7	7	IV	II	III	FV	t	DAN	NE	27
Ravnsted-Larsen (ed.) 1990	1	2	2	2	II	I	II	F?	t	DAN	E	
Diemont 1968, Bossenbroek 1980, Kreutz 1992	1	x	x	x	I	0	I	F(V)	gt	HOL	N	43 44
Orchis palustris												
Potucek 1985	4	12	14	26	I	0	I	F	t	CSR	-	
		11	12	13	I	0	I	F	t	CSR		
		10	12	19	I	0	I	F	t	CSR		
		8	9	10	I	0	I	F	t	CSR		
Högström 1991	23	9	9	9	VI	II	V	F	t	SVE	NECMB	
		9	9	9	V	III	V	F	t	SVE		
		9	9	9	V	I	III	F	t	SVE		
		9	9	9	IV	I	II	F	t	SVE		
		9	9	9	IV	0	II	F	t	SVE		
		9	9	9	III	I	III	F	t	SVE		
		9	9	9	III	I	II	F	t	SVE		
		9	9	9	III	I	II	F	t	SVE		
		9	9	9	III	I	II	F	t	SVE		
		9	9	9	II	I	I	F	t	SVE		
		9	9	9	II	I	I	F	t	SVE		
		9	9	9	II	I	I	F	t	SVE		
		9	9	9	I	0	I	F	t	SVE		
		9	9	9	I	0	I	F	t	SVE		
		9	9	9	I	0	I	F	t	SVE		
		6	7	8	I	0	I	F	t	SVE		
		6	6	6	I	0	I	F	t	SVE		
		6	6	6	I	0	I	F	t	SVE		
		4	7	8	II	I	I	F	t	SVE		

	NEP	LUP	TOY	TLO	MAX	MIN	AVG	F-V	PRE	LOC	REL	REM
Högström 1991 (continuation)		4	7	9	I	0	I	F	t	SVE		
		3	6	9	I	0	I	F	t	SVE		
		3	3	3	I	0	I	F	t	SVE		
		1	3	5	II	0	I	F	t	SVE		
Orchis purpurea												
Thirkell 1987	1	4	4	4	I	I	I	F	t	FRA	M	32
Ravnsted-Larsen (ed.) 1990	(6)	2	2	2	ΣIII	ΣI	ΣIII	F?	t	DAN	-	28
		2	2	2	II	I	I	F?	t	DAN		
		2	2	2	I	I	I	F?	t	DAN		
		2	2	2	II	II	II	F?	t	DAN		
		2	2	2	I	I	I	F?	t	DAN		
		2	2	2	I	I	I	F?	t	DAN		
		2	2	2	I	I	I	F?	t	DAN		
Morgan 1991	2	4	4	4	II	II	II	F	t	FRA	-	37
		4	4	4	II	I	II	F	t	FRA		
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	I	I	F(V)	gt	HOL	N	43 44
Orchis simia												
Willems 1982, 1985, 1991a, 1991b	1	19	19	19	II	I	I	FV	agt	HOL	NECMB	1
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	I	I	F(V)	gt	HOL	N	43 44
Orchis tridentata												
Heinrich (ed.) 1986	3	12	15	16	?	?	?	F	g	GER	-	26
		12	13	14	?	?	?	F	g	GER		
		9	12	14	?	?	?	F	g	GER		
Kümpel 1986; Reinhard et al. 1991	1	3	9	17	VII	0	V	F	g	GER	N	29
Orchis ustulata												
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Platanthera bifolia												
Vakhrameeva & Denisova 1980	2	4	4	4	II	II	II	FV	g	URS	E	5
		4	4	4	II	II	II	FV	g	URS		
Morgan 1991	2	4	4	4	V	III	IV	F	t	FRA	-	37
		4	4	4	I	0	I	F	t	FRA		37
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	0	I	F(V)	gt	HOL	N	43 44
Platanthera chlorantha												
Wegener 1987	2	6	9	13	I	I	I	F	g	GER	NE	
		5	5	8	I	I	I	F	g	GER		
Daiss et al. 1988	1	3	6	10	I	I	I	F	m	GER	NS	33
Morgan 1991	1	4	4	4	II	I	I	F	t	FRA	-	37
Diemont 1969, Bossenbroek 1980, Kreutz 1992	1	×	×	×	I	I	I	F(V)	gt	HOL	N	43 44, 45
Spiranthes spiralis												
De Mey 1971, "1973"	1	3	3	3	V	IV	IV	F	o	HOL	-	30
Salkowski 1990	1	20	21	22	I	I	I	F?	g	GER	-	
Wells 1967, 1981	1	17	17	17	V	III	IV	FV	ogm	UKD	NECMBS	1
Willems 1990a, 1990b	1	8	8	8	I	I	I	FV	ogt	HOL	NECMB	1

SPECIFIC REMARKS

1 Spin-off of a demographic study.

2 The fluctuations of a third population are described, but the three observations dispersed over the six years long observation period do not form a real time-series.

3 Size of the populations estimated here.

4 In this case counts concern clonal stems; the partial populations probably correspond to different clonal individuals.

5 The following types were distinguished: seedlings, juvenile plants, non-flowering adult plants, flowering adult plants. Counts are expressed on a logarithmic scale.

6 Extreme situation: only one individual is involved in both series !

7 Fluctuations of the number of individuals expressed per m^2, so not the size itself of the population is described here. Size of plot(s) not specified.

9 Additional information is given on five other populations (for one year). For all populations other, sometimes much higher values are given for MAX, without mentioning the year however. Information is given also on a nine years long series of a propagated colony with MAX = II.

10 Mean population size (size-classes): 1973-1985, flowering individuals only: VI; 1978-1992, flowering individuals only: V; 1978-1985, non-flowering individuals only: V. The fieldwork was restarted in 1988, results not published yet.

11 Two populations are discussed, but one of those = Vanhecke 1988.

12 The listed time-series concern parts of populations within small permanent plots.
12a: Series of 49 years (anno 1990), interrupted once by one year, cutting this overall observation-period in two parts of respectively 18 and 30 years. Tamm 1991 does not report on the other series for this species.
12b: a time-series composed of one long uninterrupted period (26 years) and several smaller periods for a total number of 40 observation years in a 47 years long observation period (anno 1990).
12c: Tamm 1991 reports only on one of both series for this species.

13 In the publication itself the time-series cover respectively seven, six and five years. Additional information for the period 1988-1990, given by the author in a letter, was also taken into account.

14 A population consisting of chlorophyll-free plants; values are given for the (clonal) plants, as well as for the individual stems (those are represented in a table).

15 Another (fifth) population, described by three observations dispersed over six years, was not incorporated into the table.

16 Within the non-flowering plants well-developed individuals are distinguished from the juvenile ones. This paper gives also information on the clonal relationships between the individuals in one year. Essentially a demographic study.

17 Actual time-series much longer (1964-1986), but repeatedly interrupted for more or less important periods.

18 Also contains detailed information on the course of the temperature and the precipitation in the same period, as well as on the phenological status of some accompanying orchid-species: *Dactylorhiza maculata*, *D. majalis*, *Gymnadenia conopsea*, *Listera ovata* and *Platanthera chlorantha*.

19 Observation series of the non-flowering plants are incomplete.

20 One observation of two individuals !

21 All 28 time-series (best possible estimation of this number) are represented on the same graph: it is impossible to distinguish between the individual series, as well to decide on the length of the series. Many (most? all?) of them must be considered as the continuation of the populations mentioned in BJÖRKBÄCK & LUNDQVIST 1982 (see 51).

22 At least two of the composing size-values of the time-series have to be considered as estimations.

23 It is not clear if not at least some observation years are missing.

24 Only the longest partial series have been maintained here: the real numbers of years during which individuals have been observed were placed between "()". 10 series on partial populations, which have been under observation only two times during the eight years of the global observation-period have been omitted from the table, because they gave not enough information as time-series. They do give some information however on the proces of expansion and on the instable nature of many of these stations. Mostly only very small colonies are concerned (< 20 individuals).

25 This time-series contains several estimations of the population's size.

26 The scale for the size of the population is not indicated on the ordinate of the graph.

27 During the first three years the individuals were not counted very precisely and flowering individuals were not separated from non-flowering ones. During the last four years, a distinction is made between the over-dispersed (grouped) and isolated flowering individuals, and between the excavated and the picked individuals.

28 Six partial populations; summed values for MAX and MIN: size-class III. The size-values for the first years have to be considered as estimations, not as exact counts.

29 It is difficult to distinguish between the successive annual observations on the graph in the original publication of Kümpel 1986. The representation of it in Reinhard et al. (1991) permits a better analysis.

30 De Mey "1973" = Bregman & De Mey 1973.

31 Observed, real counts, not the estimated values for the population size.

32 The ratio flowering / non-flowering individuals is discussed in general terms only (globalized over four years), but not for every observation-year separately.

33 The research area was composed of 11 contiguous plots of 10 x 10 m and some adjacent zones. Only synoptic distribution-maps (all orchid-species on one and the same annual map) are furnished (no tables, no graphs). Data on the size of the respective populations mentioned in the text do not always correspond with the numbers that can be extracted from the maps. It is not clear whether all partial zones have been examined in all years with the same kind of intensity.

34 In Kull 1987 a simple mathematical model is developed to forecast the length of time needed to arrive at a stationary state.

35 The three time-series given as a graph in 1991 were represented by table in 1985. Both 35b (Buckinghamshire A colony) and 35c (Buckinghamshire B colony) concern closed series. Series 35a was continued after a one year's break; older, more isolated data on the size of this Suffolk population (Rex Graham Reserve) were not given in Farrell 1985. Sanford 1991 represents the same Suffolk series from 1974 to 1991 (one year longer already). This last author represents the number of flowering individuals and of the totals of plants (making the difference gives the numbers of non-flowering plants). Farell 1991 represents the total number of plants and the number of vegetative plants (giving the number of flowering ones by making the difference). The station of series 35b was still visited for at least three years after the last occurrence of the species in 1962.

36 *Epipactis helleborine* is an alien species in Canada. Since it is therefore not protected in that country, the present demographic study could include interesting observations on the behaviour of the underground parts of the plants.

37 The observations of F. Morgan mentioned in an anonymous working group publication on the distribution of the native orchids in the "Haute-Marne" (France) are extracted from his unpublished thesis.

38 The time-series 38a was originally published in Wegener 1987 and was continued in Wegener 1988. The time-series 38b was for the first time published in Wegener 1988.

39 An extreme case: report on a two years' series of one individual of *Cephalanthera longifolia*.

40 Reinecke reports (almost) annually on the development of this population of *Dactylorhiza incarnata* in a reed belt at the "Barsbeker See" (near Kiel): special attention is drawn to the reaction of this population on the management of the site.

41 A demographic study on *Ophrys apifera* covering eleven years (the title mentions ten). The high frequency of monitoring the population (several times a year) revealed that for this species an important fraction of the population can disappear before flowering time, so that observations on the size of the population limited to that period are unavoidable incorrect.

42 A further analysis of the same data of an ten years study on *Ophrys sphegodes* (Hutchings 1989a, 1989b), linking management with matrix models.

43 Diemont 1969 reports on eleven years of observations (1958-1968) made on transplanted (sown) populations of 22 orchid taxa into the orchid garden "Gerendal". The original material of these orchids came of the North of France or was obtained from regular gardeners. Some species were sown. Bossenbroek (1980) reports on the continuation of these observations until 1978. Since most species were transplanted or sown at more than one occasion I have to refer to the original publications for more details on the lengths of the observation periods.

44 These populations are also situated in the orchid garden "Gerendal" in the Dutch province of South Limburg (see 43). It is not clear in how far they correspond to the original populations described by Diemont (1969) and Bossenbroek (1980): there is a gap of ten years between the series mentioned by Kreutz (1992) and those mentioned by Bossenbroek .

45 Inclusive *Plathanthera* x *hybrida* Brügg. (= *P. bifolia* x *P. chlorantha*).

46 *Orchis* x *beyrichii* (Rchb. f.) Kern = *O. militaris* x *O. simia.*

47 *Ophrys* x *hybrida* Pokorny = *O. insectifera* x *O. sphegodes.*

48 *Orchis* x *hybrida* Boenningh. = *O. militaris* x *O. purpurea.*

49 x *Orchiaceras spurium* (Rchb. f.) Cam. = *Aceras anthropophorum* x *Orchis militaris.*

50 *Dactylorhiza* x *venusta* (T. & T.A. Steph.) Soó = *D. fuchsii* x *D. purpurella.*

51 A preliminary report of a WWF-project on the conservation of *Nigritella nigra* in central Sweden (Jämtland). Some populations were monitored by permanent plots in order to study the effect of grazing, mowing and the use of fertilizers. The performance of *Nigritella* in these plots was followed (though not annually) but the results of this demographic approach are not discussed in this paper. Moreover the size fluctuations of some other populations were followed annually. Probably the data mentioned in BJÖRCKBÄCK et al. correspond with these populations (see 21). One of the eight graphs represents the mean values for an undefined number of partial populations.

52 The continuation of the observations on one (two) of the populations mentioned (but not really by serial observations) by Bruder & Rennwald 1990. In this last publication the fluctuations of the size of a population of *Orchis militaris* and *Ophrys apifera* only are represented by graph.

53 The first of the two series on *Gymnadenia conopsea* ended in 1986; the second is still continued. On Figure 4 (of Bruder 1992) both series are combined in the same graph and since one series starts when the other has ended, this has the misleading effect that both series appear as one and the same.

ADDITIONAL LITERATURE

Hamel & Rahn (1984) describe the expansion of *Cephalanthera rubra*, *Epipactis helleborine*, *E. atrorubens*, *Listera ovata* and *Platanthera bifolia*, but is not clear whether the given numbers correspond with the number of individuals or with the number of stations.

Heinrich (1991) gives a synthesis of the activities of the study group "Heimische Orchideen in Jena" from 1972 on. In a synoptic table Heinrich presents these activities in relation to population dynamics: 77 time-series are mentioned dealing with 23 taxa (20 species, 2 interspecific hybrids, one subspecies). Among those taxa several are recorded here for the first time: *Epipactis microphylla*, *E. palustris*, *E. purpurata*, *Orchis* x dietrichiana, *O. pallens*. Most of these observations were not published yet, although some of them cover uninterrupted periods of 21 years. On some of the series Heinrich reported already in 1986. Unfortunately the actual numbers (counts) are not mentioned. It had no sense to include these observations in the table.

Herrmann M. & E. (1981) present the ratio of the size of populations of *Orchis pallens*, *O. tridentata*, *O. purpurea*, *O. militaris*, *Ophrys apifera* and *Spiranthes spiralis* during three successive years by graphs and with respect to climatological circumstances. They give no real absolute information on the size of the populations under consideration.

Wells & Willems (1991): as mentioned before in the introduction, a most important recent book covering many interesting studies on the population dynamics and population ecology of orchids. Contains the papers of an international symposium held in 1990 in South Limburg, The Netherlands. Apart from several papers that were included in the synoptic table, because they concern the population dynamics of European orchids, other interesting papers deal with various related subjects, such as the dynamics of flowering and fruiting, the phenology of growth and dry matter partitioning and the translation of population dynamics into matrix models of American, Australian and European terrestrial orchids.

CITED LITERATURE

Asbirk, S. (ed.), 1988. Overvågning af orkideer 1987. Skov- og naturstyrelson, miljoministeriet. Unpublished (93 pp. xeroxed photocop.).

Björkbäck, F. & J. Lundqvist, 1982. Aktion Brunkullan - ett botanisk WWF-projekt. *Svensk Bot. Tidskr.* 75: 215-228.

Björkbäck, F., J. Lundqvist & C.-O. Wetterhall, 1986. Brunkullan - en hotad ängs-och hagmarksväxt. *Fauna och Flora* 81: 192-194.

Bossenbroek, Ph., 1980. 20 jaar orchideeëntuin in Limburg - Stand van zaken. *Natuurhist. Maandbl.* 69: 131-136.

Böhnert, W. & G. Hamel, 1988. Zur gegenwartigen Situation des Kleinen Knabenkrautes (*Orchis morio* L.) in der DDR - Populationssituation, Schutz und Betreuung. *Arch. Nat. schutz Landsch.forsch.* (Berlin) 28: 101-119.

Bregman, S. & P. De mey, 1973. *Spiranthes spiralis* (L.) Chevall. op Goeree. *Gorteria* 6: 156.

Bruder, K., 1992. Positive Auswirkungen von Pflegemaßnahmen auf einige Orchideenarten an einem Beispiel aus der Vorbergzone des Schwarzwaldes bei Ettenheim. *Mitt. Bl. Arbeitskr. Heim. Orch. Baden-Württ.* 24: 531-539.

Bruder, K. & E. Rennwald, 1990. Orchideen auf Gemarkung Ettenheim - Ergebnisse einer verfeinerten Kartierungsmethode. *Mitt. Bl. Arbeitskr. Heim. Orch. Baden-Württ.* 22: 237-305.

Daiss, H. , M. Heennecke & P. Schneider, 1988. Pflegemaßnahmen zur Erhaltung orchideenreichen Trockenstandorte im Schwäbischen Wald. *Mitt. Bl. Arbeitskr. Heim. Orch. Baden-Württ.* 20: 75-101.

De Mey, P., 1971. Een telling van *Spiranthes spiralis* (L.) Chevall. op Goeree. *Gorteria* 5: 266-267.

Diemont, W.H., 1969. Zehn Jahre Freilandkultur einiger einheimischer Orchideen im "Gerendal", Niederl. Limburg. *Vegetatio* 18: 330-347.

Farrell, L., 1985. Biological Flora of the British Isles. No 160 *Orchis militaris* L. *Journ. Ecol.* 73: 1041-1053.

Farrell, L., 1991. Population changes and management of *Orchis militaris* at two sites in England. In Wells, T.C.E. & Willems, J.H. (eds.), Population ecology of terrestrial orchids, pp. 63-68. The Hague, SPB Academic Publishing.

Finke, L., 1991. Beobachtungen an einem Standort der Spinnen-Ragwurz (*Ophrys sphecodes*) im Kreis Rudolstadt. *Ber. Arbeitskr. Heim. Orch.* 8(2): 100-102.

Hamel, G., 1977. Beobachtungen zur Populationsdynamik der *Dactylorhiza majalis* (Rchb.) Hunt & Summerh. *Mitt. Arbeitskr. Heim. Orch. (DDR)* 7: 86-89.

Hamel, G. & A. Rahn, 1984. Beobachtungen über Ausbreitung von Orchideenarten infolge von Industrieimmission. *Mitt. Arbeitskr. Heim. Orch. (DDR)* 13: 32-40.

Heinrich, W. (ed.), 1986. Zur Situation der Orchideen im Bezirk Gera. *Veröff. Naturhist. Mus. Schleusingen* 1986: 81-92.

Heinrich, W., 1987. Kartierung heimischer Orchideen - Grundlage für Maßnahmen des Arten- und Biotopschutzes. *Mitt. Ges. Natur u. Umwelt, Bez.-vorstand Gera* (Gera) 6: 50-58.

Heinrich, W., 1991. Die Fachgruppe Heimische Orchideen in Jena. *Ber. Arbeitskr. Heim. Orch.* 8(2): 8-24.

Hemke, E., 1987. Beitrag zur Populationsentwicklung und Standortamplitude der Steifblättrigen Kuckucksblume (*Dactylorhiza incarnata* (L.)). *Mitt. Arbeitskr. Heim. Orch. (DDR)* **16**: 47-50.

Hermann, M. & R., 1981. Registrierte Fluktuationenheimischer Orchideen nach den letzten 3 Strengwintern. *Mitt. Arbeitskr. Heim. Orch. (DDR)* **10**: 47-50.

Hermy, M. & L. Vanhecke, 1990. Orchids and nature management in Flanders: results of a mail questionnaire and a timely review of the situation. *Mém. Soc. Roy. Bot. Belg.* **11**: 87-105.

Heyer, J., 1991. Die Spinnen-Ragwurz in Ostthüringen. *Ber. Arbeitskr. Heim. Orch.* **8(2)**: 95-99.

Hoffmann, J., 1987. Erste Untersuchungsergebnisse über eine Vorkommen von *Cephalanthera damasonium* (Mill.) Druce in der Märkischen Schweiz bei Waldsieversdorf. *Mitt. Arbeitskr. Heim. Orch. (DDR)* **16**: 44-46.

Högström, S., 1991. Kärrnycklar, *Orchis palustris* på Gotland 1982-1990. *Svensk Bot. Tidskr.* **85**: 355-376.

Hutchings, M.J., 1987a. The population biology of the early Spider orchid, *Ophrys sphegodes* Mill. I. A demographic study from 1975 to 1984. *Journ. Ecol.* **75**: 711-727.

Hutchings, M.J., 1987b. The population biology of the early Spider orchid, *Ophrys sphegodes* Mill. I. Temporal patterns in behaviour. *Journ. Ecol.* **75**: 729-742.

Hutchings, M.J., 1989. Population biology and conservation of *Ophrys sphegodes*. In Pritchard, H.W. (ed.), Modern methods in Orchid Conservation, pp. 101-115. Cambridge, Cambridge University Press.

Inghe, O. & C.O. Tamm, 1988. Survival and flowering of perennial herbs. V. Patterns of flowering. *Oikos* **51**: 203-219.

Jäger, S., 1989. *Leucorchis albida* im Hochtaunus. *Ber. Arbeitskr. Heim. Orch. (DDR)* **6(1)**: 137-140.

Kapteyn den boumeester, D.W., 1989. Orchideeën in de Amsterdamse Waterleidingsduinen. *Eurorchis* **1**: 82-92.

Kreutz, C.A.J., 1981. De orchideeën in Zuid-Limburg; resultaten van een totale inventarisatie in 1980. *Natuurhist. Maandbl.* **70**: 35-39, 51-55, 86-93, 105-108.

Kreutz, C.A.J., 1987. De verspreiding van de inheemse orchideeën in Nederland. *Natuurhist. bib. K.N.N.V.*, **44**: 257 pp.

Kreutz, C.A.J., 1992. Orchideeën in Zuid-Limburg. *Natuurhist. bib. K.N.N.V.*, **58**: 304 pp.

Kull, T., 1987. Population ecology of *Cypripedium calceolus* L. In Laassinir, L. & Kull, T. (eds.), *The plant cover of Estonian SSR. Flora, Vegetation and Ecology*, pp. 77-83. Tallinn, Valgus.

Kull, T. & K. Kull, 1991. Preliminary results from a study of populations of *Cypripedium calceolus* in Estonia. In Wells, T.C.E. & Willems, J.H (eds.), Population ecology of terrestrial orchids, pp. 69-76. The Hague, SPB Academic Publishing.

Kümpel, H., 1986. Vorkommen, Gefährdung und Schutz der Orchideen im Bezirk Suhl. *Veröff. Naturhist. Mus. Schleusingen* **1986**: 73-80.

Kümpel, H., W. Eccarius, W. Heinrich & W. Westhus, 1989. Die vom Aussterben bedrohten Orchideenarten Thüringens. *Landschaftspfl. Natursch. Thüringen* **26**, (Sonderh.1989): 16 pp.

Light, M.H.S. & M. Macconaill, 1991. Patterns of appearance in *Epipactis helleborine* (L.) Crantz. In Wells, T.C.E. & Willems, J.H (eds.), Population ecology of terrestrial orchids, pp. 77-87. The Hague, SPB Academic Publishing.

Morgan, F., 1991. In Anonymous (groupe orchidophile de la S.S.N.H.M.), Cartographie des orchidées de la Haute-Marne. Paris, Soc. Franç. d'Orchidophilie. 40 pp.

Mösch, U., 1988. Orchideen in Pappelanpflanzungen. In Anonymous, 1969-1989: Zwanzig Jahre Fachgruppe für Natursch. "Walter Gotsmann", Kulturbund der DDR, Gesell. für Natur und Umwelt, Neustrelitz: 37-38.

Potucek, O., 1985. Zur Problematik der Wiesenorchideen in der CSSR. *Mitt. Arbeitskr. Heim. Orch. (DDR)* **14**: 54-62.

Potucek, O., 1987. Zur Problematik der Waldorchideen in der CSSR. *Mitt. Arbeitskr. Heim. Orch. (DDR)* **16**: 27-31.

Poulsen, L.B., 1987.: Frueskoen (*Cypripedium calceolus* L.). *Skov- og Naturstyrelsens midlertidige interne meddelelsesblad* **1(4)**: 25-27.

Ravnsted-larsen, L., 1987. Bestandssvingninger hos Salep Gøgeurt (*Orchis morio*) på en overdrevslokalitet på Samsø. *Urt* **1987**: 76-79.

Ravnsted-larsen, L., 1988. Naturovervågning på en lokalitet med Mygblomst (*Liparis loeselii*). *Gjrfruglen* (Arhus) **24**: 52-57.

Ravnsted-larsen, L. (ed.), 1990. Naturovervågning i Storstrøms amt 1989. Storstrøms amt Landskabskontoret. Unpublished (80 pp. xeroxed photocop.)

Reinecke, F., 1986. Aufruf zur Untersuchung der Populations-Dynamik von Orchideen. *Ber. Arbeitskr. Heim. Orch. (DDR)* **3**: 156-162.

Reinecke, F., 1988. Bericht über die Pflege eines *Dactylorhiza incarnata*-Biotops und die Entwicklung der Population. *Die Orchidee* **39**: 140-144, 173-176.

Reinecke, F., 1991. Wachstumbeschleunigung und Sensibilität einer Population. *Arbeitsgem. Heim. Orch. Schlesw.-Holst. Tätigkeitsbericht* **1990**: 22-23.

Reinecke, F., 1992. Pflegemaßnahmen. *Arbeitsgem. Heim. Orch. Schlesw.-Holst. Tätigkeitsbericht* **1991**: 2-3.

Reinhardt, J., 1988. *Epipogium aphyllum* SW. - Bemerkungen zu einer seltenen Orchideenart in der DDR. *Mitt. Arbeitskr. Heim. Orch. (DDR)* **17**: 7-13.

Reinhard, H.R., P. Gölz, R. Peter, & H. Wildermuth, 1991. Die Orchideen der Schweiz und angrenzender Gebiete. Egg, Fotorotar. 348 pp.

Richardson, J.A., 1957. The development of orchid populations in claypits in county Durham. *Proc. Bot. Soc. Brit. Isles* **2**: 354-361.

Salkowski, H.-E., 1990. 20 Jahre *Spiranthes spiralis* (L.) Chevall. im Rabengrund bei Wiesbaden. *Ber. Arbeitskr. Heim. Orch.* **7**(2): 73-76.

Salmia, A., 1986. Chlorophyll-free form of *Epipactis helleborine* (*Orchidaceae*) in SE Finland. *Ann. Bot. Fennici* **23**: 49-57.

Salmia, A., 1988. Hyvinkään tikankontit. *Lutukka* **4**: 35-40.

Sanford, M., 1991. The orchids of Suffolk. Ipswitch, Suffolk Natur. Soc. 123 pp.

Sarosiek, J. & K. Kolon, 1989. Ecological organization of some orchid species populations in Poland. Soc. Franç. d'Orchidoph., 11ème coll., Paris 25-25 nov. 1989: 253-264.

Schadwinkel, H., 1987. Zum Vorkommen, zur Gefahrdung und Schutzproblematik des kleinblutigen Einblattes *Malaxis monophyllos* (L.) SW. in Thüringen (DDR). *Orchideen* **1987**: 22-29 + 4 pp. photogr.

Schadwinkel, H., 1989. Zum Einfluß ökoklimatischer Faktoren auf die Wuchsrhythmik und das Bluhverhalten heimischer Orchideeen. *Mitt. Arbeitskr. Heim. Orch. (DDR)* **18**: 25-36.

Sipkes, C., 1983. Over fluctuaties in orchideeënpopulaties, vooral veroorzaakt door dieren. *Gorteria* **11**: 208-210.

Stahl, H., 1989. Zur Entwicklung einer Population von *Ophrys apifera* im Gebiet von Stuttgart. *Mitt. Bl. Arbeitskr. Heim. Orch. Baden-Württ.* **21**: 1015-1039.

Sterk, A.A., 1976a. Jaarlijkse registratie van aantallen individuen van zeer zeldzame Nederlandse plantesoorten en de populatiedynamica. *Gorteria* **8**: 1-11.

Sterk, A.A., 1976b. *Anacamptis pyramidalis* bij Wijk aan Zee. *Gorteria* **8**: 81-85.

Summerhayes, V.S., 1951. Wild orchids of Britain. London, Collins. 366 pp.

Tamm, C.O., 1948. Observations on reproduction and survival of some perennial herbs. *Bot. Not.* **3**: 303-321.

Tamm, C.O., 1972. Survival and flowering of some perennial herbs. II The behaviour of some orchids on permanent plots. *Oikos* **23**: 23-28.

Tamm, C.O., 1991. Behaviour of some orchid populations in a changing environment. Observations on permanent plots, 1943-1990. In Wells, T.C.E. & Willems, J.H (eds.), Population ecology of terrestrial orchids, pp. 1-13. The Hague, SPB Academic Publishing.

Thirkell, Ph., 1987. Station d'orchidées en Ile-de-France, évolution sur quatre ans. *L'Orchidoph.* **79**: 1412-1416.

Vakhrameeva, M.G. & L.V. Denisova, 1988. The dinamics (sic) of the number of coenopopulations of three species of orchids (Engl. summ.). *Vestnik Moskovskogo Universiteta, Ser. 16 Biologica*, **1**: 58-63.

Vanhecke, L., 1985. Pattern development in a dune slack population of *Dactylorhiza praetermissa*. In: Beeftink, W.G., Rozema, J. and Huiskes, A.H.L. (eds.), Ecology of coastal vegetation, pp. 557-558. Dordrecht, Junk Publishers.

Vanhecke, L., 1988. Veranderingen in een kustpopulatie van de Rietorchis. *De Lev. Nat.* **89**: 43-49.

Vanhecke, L., 1991. Population dynamics of *Dactylorhiza praetermissa* in relation to topography and inundation. In Wells, T.C.E. & Willems, J.H. (eds.), Population Ecology of terrestrial Orchids, pp. 17-35. The Hague, Academic Publishing.

Vanhecke, L., 1993. Serial observations on the size of European orchid populations: a technical report on a preliminary survey. *Eurorchis* **5** (in print).

Van wijngaarden, E.J., 1989. Een vindplaats van *Ophrys apifera* var. *aurita* in Zeeland. *Eurorchis* **1**: 129-137.

Vöth, W., 1980. Naturgegebenes Verhalten von *Gymnadenia conopsea* und *Listera ovata*. *Jahresber. Naturwiss. Ver. Wupp.* **33**: 136-145.

Wagner, K., 1988. Die Varianten der Bocksriemenzunge *Himantoglossum hircinum* (L.) Spreng. im FND "Südhang Lobdeburg" bei Jena in Thüringen (DDR). *Mitt. Arbeitskr. Heim. Orch. (DDR)* **17**: 19-25.

Waite, S., 1989. Predicting population trends in *Ophrys sphegodes* Mill. In Pritchard, H.W. (ed.), *Modern methods in Orchid Conservation*, pp. 117-126. Cambridge, Cambridge University Press.

Waite, S. & M. Hutchings, 1991. The effects of different management regimes on the population dynamics of Ophrys sphegodes: analysis and description using matrix models. In Wells, T.C.E. & Willems, J.H (eds.), Population ecology of terrestrial orchids, pp. 161-175. The Hague, Academic Publishing.

Wegener, U., 1987. Moglichkeiten der forstlichen Bewirtschaftung zum Schutz von Waldorchideen. *Mitt. Arbkr. Heim. Orch. (DDR)* **16**: 14-24.

Wegener, U., 1988. Schutz vom Waldorchideen durch Biotoppflege. *Veröff. Museen Gera* **15**: 36-39.

Wells, T.C.E., 1967. Changes in a population of *Spiranthes spiralis* (L.) Chevall. at Knocking Hoe national nature reserve, Bedfordshire, 1962-1965. *Journ. Ecol.* **55**:

83-99.

Wells, T.C.E., 1981. Population ecology of terrestrial orchids. In Synge, H. (ed.), The Biological Aspects of Rare Plant Conservation, pp. 281-295. Chichester, J. Wiley & Sons.

Wells, T.C.E. & R. Cox, 1989. Predicting the probability of the bee orchid (*Ophrys apifera*) flowering or remaining vegetative from the size and number of leaves. In Pritchard, H.W. (ed.), Modern methods in Orchid Conservation, pp. 127-139. Cambridge, Cambridge University Press.

Wells, T.C.E. & R. Cox, 1991. Demographic and biological studies on *Ophrys apifera*: some results of a ten years study. In Wells, T.C.E. & Willems, J.H (eds.), Population ecology of terrestrial orchids, pp. 47-61. The Hague, SPB Academic Publishing.

Willems, J.H., 1978. Populatiebiologisch onderzoek aan *Orchis mascula* (L.) L. op enkele groeiplaatsen in Zuid-Limburg. *Gorteria* **9**: 71-80.

Willems, J.H., 1982. Establishment and development of a population of *Orchis simia* Lamk. in the Netherlands, 1972 to 1981. *New Phytol.* **91**: 757-765.

Willems, J.H., 1985. Populatieonderzoek aan orchideeën. *The Utrecht Plant Ecology News Report* **1985**: 98-103.

Willems, J.H., 1990a. Population dynamics of *Spiranthes spiralis* in South-Limburg, The Netherlands. *Mém. Soc. Roy. Bot. Belg.* **11**: 115-121.

Willems, J.H., 1990b. Meerjarige populatiestudie aan inheemse orchideeën. *De Lev. Nat.* **91**: 134-139.

Willems, J.H. & L. Bik, 1991. Long-term dynamics in a population of *Orchis simia* in the Netherlands. In Wells, T.C.E. & Willems, J.H (eds.), Population ecology of terrestrial orchids, pp. 33-45. The Hague, SPB Academic Publishing.

Willing, B. & E. Willing, 1977. Bibliographie über die Orchideen Europas und der Mittelmeerländern 1744-1976. *Willdenowia*, Beiheft **11**. 325pp.

Willing, B. & E. Willing, 1985. Bibliographie über die Orchideen Europas und der Mittelmeerländern. Supplement *Englera* **5**. 280pp.

Willing, E. , 1984 en 1987. Literatur-Dienst "Europäische Orchideen" 1984/2 en 1987/2. *Mitt. Bl. Arbeitskr. Heim. Orch.*, **16**: 664-674; ibidem **19**:939-960.

Willing, E., 1985-1991. Literatur-Dienst "Europäische Orchideen" 1985/1 - 1991/2. *Ber. Arbeitskr. Heim. Orch.* **2**: 143-154, 325-340; ibidem **3**: 169-186, 287-308; ibidem **4**: 150-168; ibidem **5**: 141-160, 161-185; ibidem **6**(1): 163-188; ibidem **6**(2): 100-124; ibidem **7**(1): 98-132; ibidem **7**(2): 83-122; ibidem **8**(1): 94-119; ibidem **8**(2): 129-156.

Wisniewski, N., 1977. Populationsdynamik von *Liparis loeselii* (L.) Rich. an einem Sekundärstandort im Flachland der DDR. *Mitt. Arbeitskr. Heim. Orch. (DDR)* **7**: 58-60.

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